Short Communication

Lithium Plating as Limiting Phenomena for Estimating Safety during Lithium-Ion Battery Charging

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During charging, lithium-ion (Li-ion) batteries can undergo lithium plating if the charging current is too high. This process will reduce battery capacity and affect the safety performance of batteries. This paper proposes a method for estimating the allowable maximum charging current for Li-ion batteries at different states of charge (SOCs), employs an electrochemical model, and uses lithium plating as the threshold. The main achievements include (1) developing a new model based on the SP+ model, redescribes some of the equations and parameters used in the SP+ model, and more accurately reflects the conditions of Li-ion battery anodes; (2) determining the specific operating conditions used to identify the model parameters, identifying each model parameter, and performing an error analysis; and (3) using this model to produce relationship diagrams of the anode potential and current versus SOC, thus identifying the allowable maximum charging current for Li-ion batteries at different SOC.

Keywords: lithium-ion battery, electrochemical model, parameter identification, lithium plating, allowable maximum charging current

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